

CLAIMS

I claim:

1 1. An ion detector for a time-of-flight mass spectrometer comprising at
2 least two anodes wherein said anodes detect different fractions of incoming ions.

1 2. An ion detector according to claim 1, wherein the size of at least one
2 anode differs from the size of at least one other anode.

1 3. An ion detector according to claim 1, wherein a variable electrical
2 potential on at least one anode modifies incoming ion flight paths such that the anodes
3 detect different fractions of the incoming particles.

1 4. An ion detector according to claim 1, wherein a variable magnetic field
2 in the detector modifies incoming ion flight paths such that the anodes detect different
3 fractions of the incoming particles.

1 5. An ion detector according to claim 1, wherein the ion detector
2 geometry causes the anodes to detect different fractions of the incoming particles.

1 6. A method for creating an ion spectrum in a time-of-flight mass
2 spectrometer comprising:

- 3
- 4 (a) recording histograms from at least two anodes wherein said anodes
5 detect different fractions of incoming ions;
- 6
- 7 (b) determining which regions of the histogram recorded by at least one
8 anode that detects a larger fraction of incoming ions are saturated;
- 9
- 10 (c) creating spectra for saturated regions by applying a weighting factor
11 to the histogram recorded by the anode that detects a smaller fraction
12 of incoming ions;
- 13
- 14 (d) creating spectra for unsaturated regions using unweighted histograms;
15 and
- 16
- 17 (e) merging said spectra to form said final ion spectrum.

1 7. The method of claim 5 wherein said saturation determining step further
2 comprises treating certain regions as saturated based upon an expected mass
3 distribution of a sample.

1 8. The method of claim 5 where said saturation determining step further
2 comprises comparing the histograms recorded by said anodes on a region by region
3 basis to create histogram ratios for each region and designating a region as saturated
4 when its histogram ratio differs substantially from the histogram ratios for other
5 regions.

1 9. The method of claim 5 wherein said anode fraction is determined
2 theoretically based upon the anode sizes, anode electrical potentials, ion detector
3 magnetic fields, and ion detector geometry.

1 10. The method of claim 5 wherein said anode fraction is determined
2 empirically by comparing histogram peaks for semi-abundant species which are not
3 so abundant as to cause saturation on the histogram of the large fraction anode but are
4 still sufficiently abundant so as to register a meaningful result on the small fraction
5 anode.